



## MATH2111 Functional analysis

[30h+15h exercises] 5 credits

This course is taught in the 1st semester

**Teacher(s):** Michel Willem  
**Language:** French  
**Level:** Second cycle

### Aims

Aims to provide with the bases of functional analysis necessary to a modern study of partial differential equations, optimisation problems, numerical analysis, etc.

### Main themes

- Hahn-Banach, Banach- Steinhaus, closed graph theorems.
- Lebesgue  $L_p$  spaces : completeness, density, regularization, compactness.
- Duality and weak convergence : duality of spaces  $L_p$ , weak sequential compactness, etc.
- Weak derivatives and Sobolev spaces
- Spectral theory: compact operators, etc.

### Other information (prerequisite, evaluation (assessment methods), course materials recommended readings, ...)

Evaluation: quaterly written examination.

References: H. Brezis, Analyse fonctionnelle; M. Willem, book in preparation

### Other credits in programs

<b>MAP22</b>	Deuxième année du programme conduisant au grade d'ingénieur civil en mathématiques appliquées	(5 credits)	
<b>MATH21/E</b>	Première licence en sciences mathématiques (Economie mathématique)	(5 credits)	Mandatory
<b>MATH21/G</b>	Première licence en sciences mathématiques (Général)	(5 credits)	Mandatory
<b>MATH21/S</b>	Première licence en sciences mathématiques (Statistique)	(5 credits)	Mandatory